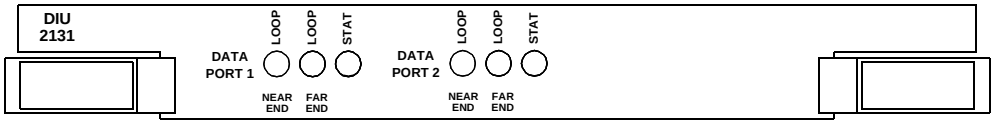
Verilink DIU 2131High-Low Module User Manual

September 1999

P/N 880-502765-001-D1



VERILINK®

Copyright Notice

Copyright © 1999 Verilink Corporation. All rights reserved.

This document does not create any express or implied warranty about Verilink or about its products or services. Verilink's sole warranty is contained in its product warranty. The end-user documentation is shipped with Verilink's products and constitutes the sole specifications referred to in the product warranty. Verilink has made reasonable efforts to verify that the information contained herein is accurate, but Verilink assumes no responsibility for its use or for any infringement of patents or other rights of third parties that may result. The customer is solely responsible for verifying the suitability of Verilink's products for its use. Specifications are subject to change without notice.

Trademarks

Verilink is a registered trademark of Verilink Corporation. Access System 2000, WANscope, VeriStats, and FrameStart are trademarks of Verilink Corporation.

Any named products herein are trademarks of their respective companies.

FCC Requirements

This equipment has been tested and found to comply within the limits for a Class A digital device pursuant to Part 15 of the Federal Communications Commission (FCC) rules. These limits are designed to provide protection against harmful interference in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user manual, can cause harmful interference to radio communications.

There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception—which can be determined by turning the equipment off and on—try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with Part 68 of the FCC Rules. On the rear, side or bottom of the unit is a label that contains the FCC registration number and other information. If requested, provide this information to the telephone company.

- All direct connections to the network lines must be made using standard plugs and jacks (compliant with Part 68). The following tables list the applicable registration jack universal order codes (USOCs), facility interface codes (FICs), and service order codes (SOCs). These are required to order service from the telco.

For T1 interfaces:

Port ID	REN / SOC	FIC	USOC
1.544 Mbit/s SF 1.544 Mbit/s SF, B8ZS 1.544 Mbit/s ANSI ESF 1.544 Mbit/s ANSI ESF, B8ZS	6.0N	04DU9 -BN 04DU9 -DN 04DU9 -1KN 04DU9 -1SN	RJ-48C jack

For DDS interfaces:

Port ID	REN / SOC	FIC	USOC
56 kbit/s 64 kbit/s	6.0N	04DU5 -56 04DU5 - 64	RJ-48S jack

- If the unit appears to be malfunctioning, inform the telco and disconnect it from the network lines until the source of trouble is determined to be your equipment or the telephone line . If your equipment needs repair, it should not be reconnected until it is repaired.
- The unit has been designed to prevent harm to the network. If the telephone company finds that the equipment is exceeding tolerable parameters, it can temporarily disconnect service. In this case, the telephone company will provide you advance notice if possible.

- If the telephone company alters its equipment in a manner that can affect the use of this device, it must give you warning so that you have the opportunity to maintain uninterrupted service. You will be advised of your right to file a complaint with the FCC.
- No customer is authorized to repair this equipment, regardless of warranty status. All repairs must be performed by Verilink or an authorized agent. It is the responsibility of users requiring service to report the need for service to Verilink or to one of our authorized agents.

Lithium Battery

The lithium battery referred to in the following notices is contained inside the clock chip.

English

DANGER!

The battery can explode if incorrectly replaced! Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

DANGER!

To avoid electrical shock in case of failure, the power supply must be installed by a professional installer. The terminal labeled with the ground symbol (⏚) on the power supply must be connected to a permanent earth ground.

CAUTION!

Interconnecting circuits must comply with the requirements of EN60950:1992/A4:1997 Section 6.2 for telecommunications network voltages (TNV) circuits.

Français

ATTENTION!

Une explosion peut se produire si la batterie est remplacée d' une façon incorrecte! Remplacez-la seulement avec le même modêle de batterie ou un modèle équivalent selon les recommendations de manufacture. Disposez de les batteries usées selon les instructions de manufacture.

ATTENTION!

Pour éviter choc électrique en cas de insuccès, la provision de pouvoir doit êtré installé par un installeur professionnel. Le terminal de la provision de pouvoir, marqué du symbol de terre, (⏚) doit connecté à un circuit de terre permanent.

PRUDENT!

Les circuits doivent êtré interconnectés de manière à ce que l' équipement continue a êtré en agrément avec "EN60950:1992/A4:1997, Section 6.2, pour les circuits de voltage de liaisons d' échanges (réseau) par les télécommunications (TNV)," après les connections de circuits.

Español

ATENCION!

La bateria puede explotar si se reemplaza incorrectamente. Reemplace la bateria con el mismo tipo de bateria ó una equivalente recomendada por el manufacturero. Disponga de las baterias de acuerdo con las instrucciones del manufacturero.

ATENCION!

Para evitar contacto con circuitos que electrocutan, la fuente de alimentación debe ser instalada por un técnico profesional. La terminal de la fuente de alimentación marcada con el símbolo de tierra (⏚) debe ser conectada a un circuito de vuelta por tierra permanente.

PELIGRO!

Circuitos que se interconectan a la red de telecomunicaciones deben hacerse de tal manera que cumplan con los requisitos estipulados en las especificaciones "EN60950:1992/A4:1997, Sección 6.2, para los voltages de circuitos interconnectados a la Red de Telecomunicaciones (TNV)," despues de terminar las connecciones entre los circuitos.

Deutsch

VORSICHT!

Explosionsgefahr bei unsachgemäßem Ersetzen der Batterie! Batterie gleichen Typs und gleicher Qualität benutzen, wie vom Hersteller empfohlen. Entsorgung der Batterie nach Anweisung des Herstellers!

VORSICHT, GEFAHR!

Um keinen Schlag zu erhalten beim Versagen der electrischen Anlage, muss der Stromanschluss von einem Elektriker vorgenommen werden. Der elektrische Pol, versehen mit dem Erdsymbol (⏚) muss am Stromanschluss permanent geerdet sein.

VORSICHT!

Schaltungen, die in den Geräten zusammengeschaltet sind, müssen weiterhin den Vorschriften EN60950:1992/A4:1997, Absatz 6.2 für Telecommunications Netz Spannung (TNV) Schaltkreize entsprechen.

Canadian Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A) prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

The Industry Canada label indentifies CS-03 certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Safety Precautions

This equipment is intended to be installed only in a Restricted Access Location that meets the following criteria:

- Access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that must be taken.
- Access can only be gained through the use of a lock and key or other means of security, and is controlled by the authority responsible for the location.

When handling this equipment, follow these basic safety precautions to reduce the risk of electric shock and injury:

- Follow all warnings and instructions marked on the product and in the manual.
- Unplug the hardware from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a cloth slightly dampened with water.
- Do not place this product on an unstable cart, stand, or table. It may fall, causing serious damage to the product.
- Slots and openings in the shelves are provided for ventilation to protect them from overheating. These openings must not be blocked or covered. Never place this product near a radiator or heat register.

- This product should be operated only from the type of power source indicated on the marking label and manual. If you are unsure of the type of power supply you are using, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will interfere with the free movement of people.
- Do not overload wall outlets and extension cords, as this can result in fire or electric shock.
- Never push objects of any kind into the shelves. They may touch dangerous voltage points or short out parts that could result in fire or electric shock. Never spill liquid of any kind on this equipment.
- Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    - When the power supply cord or plug is damaged or frayed.
    - If liquid has been spilled into the product.
    - If the product has been exposed to rain or water.
    - If the product has been dropped or if the cabinet has been damaged.

Product Warranty

Verilink's product warranty covers repair or replacement of all equipment under normal use for a five-year period from date of shipment. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer. Our in-house Repair Center services returns within ten working days.

Customer Service

Verilink offers the following services:

- System Engineers at regional sales offices for network design and planning assistance (800) 837-4546
- Technical Assistance Center for free 24x7 telephone support during installation, maintenance, and troubleshooting (800) 285-2755 and support@verilink.com)
- To return a product, it must be assigned a Return Materials Authorization (RMA) number before sending it to Verilink for repair (800) 926-0085, ext. 2282
- Maintenance contracts and leasing plans (800) 837-4546
- Technical Training on network concepts and Verilink products (800) 282-2755 and training@verilink.com
- Web site (www.verilink.com)

Publications Staff

This manual was written and illustrated by Laine Tammer. Contributing Writers and Editors: David Gardner, Marie Metivier, Barbara Termaat, and Steve Rider.

Table of Contents

1 High-Low Application 1-1
- **Overview 1-1**
  - **Network Management 1-2**

2 Quick Set-up 2-1
- **Sample Application 2-1**
- **Physical Configuration 2-2**
- **Software Configuration 2-2**
  - **Logging on 2-3**
  - **SCC 2020 ..... 2-3**
  - **DIU 2131 ..... 2-3**

3 Configuration Menu 3-1
- **Pre-requisites 3-1**
- **Configuring the DIU 2131 ..... 3-1**
  - **Menu Layout 3-2**
  - **Assigning the DIU to a CSU 3-2**
  - **Setting DIU up for Multiplexing 3-3**
  - **Summary of Commands 3-4**

4 Diagnostics and Troubleshooting 4-1
- **DIU 2131 Front Panel 4-1**
  - **Near End Loop LED 4-1**
  - **Far End Loop LED 4-1**
  - **STAT LED 4-1**
  - **Monitoring Test Pattern Errors 4-3**
  - **Monitoring Leads and Status 4-4**

A Specifications A-1

Chapter 1

High-Low Application

This user manual describes the DIU 2131 High-Low module within Verilink's Access System 2000 (AS2000) platform. This module operates in conjunction with a CSU—either an SCC 2020, TAC 2010 or DIDCSU 2912—to multiplex a high-speed and low-speed application onto a single T1. The latest firmware revisions, SCC 2.06 and TAC 1.6, enable the user to configure all of the modules at the far end node, not just the controller. Passwords are used to control access between the near and far ends.

NOTE: *This manual requires familiarity with standard telecommunications terminology, applications, and practices.*

Overview

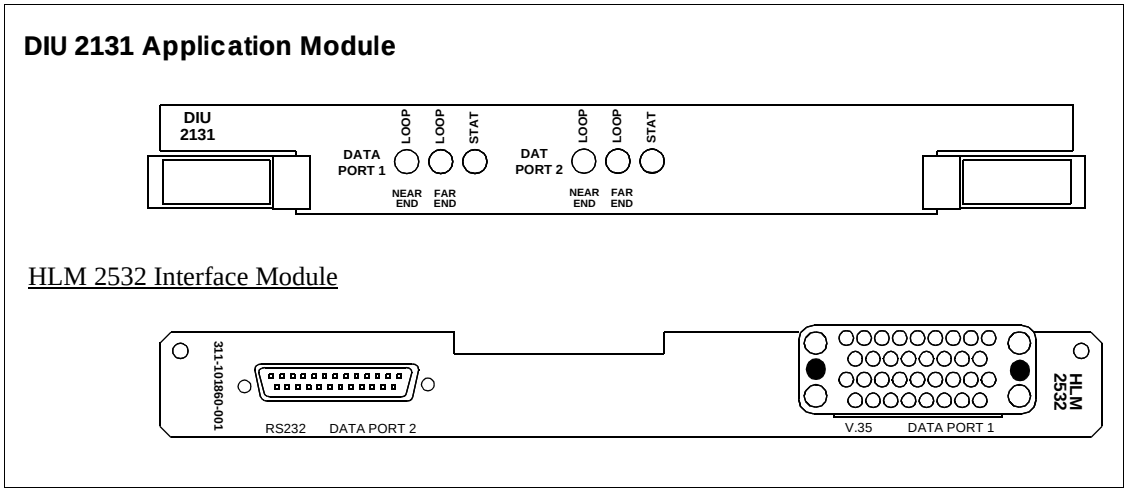
The High-Low module multiplexes up to 24 channels from two synchronous ports—one high-speed for aggregating multiple data channels and one low-speed for subrate data—and transfers the information onto a single T1 line.

There are two data ports on the DIU 2131 rear connector module, the HLM 2532:

- Port 1 is a high-speed V.35 synchronous port, providing $n \times 56$ (default) or $n \times 64$ kbit/s of bandwidth.
- Port 2 is a low-speed RS-232 synchronous port using a single DS0, providing speeds of 2.4, 4.8, 9.6, 19.2, 28.8, 38.4, 56, or 64 kbit/s.

The front modules and their rear connector modules are shown in the figures below.

Figure 1-1 DIU 2131 Front Panel with HLM 2532



Network Management

The DIU 2131 can be in a node controlled by an SCC or NCM controller module. These controllers can be managed by the Craft interface, SNMP or Node Manager. Remotely located users can also use Telnet over Ethernet or SLIP to access the Craft interface. See the user manual for the controller in your node.

Chapter 2

Quick Set-up

The DIU 2131 multiplexes data from a high-speed and low-speed application onto a shared T1 line. The high-speed application could be a file server, router, bridge, video teleconference codec, or any device with a synchronous connection. The low-speed application can be up to 64 kbit/s, or one T1 timeslot. A typical application is an automatic teller machine.

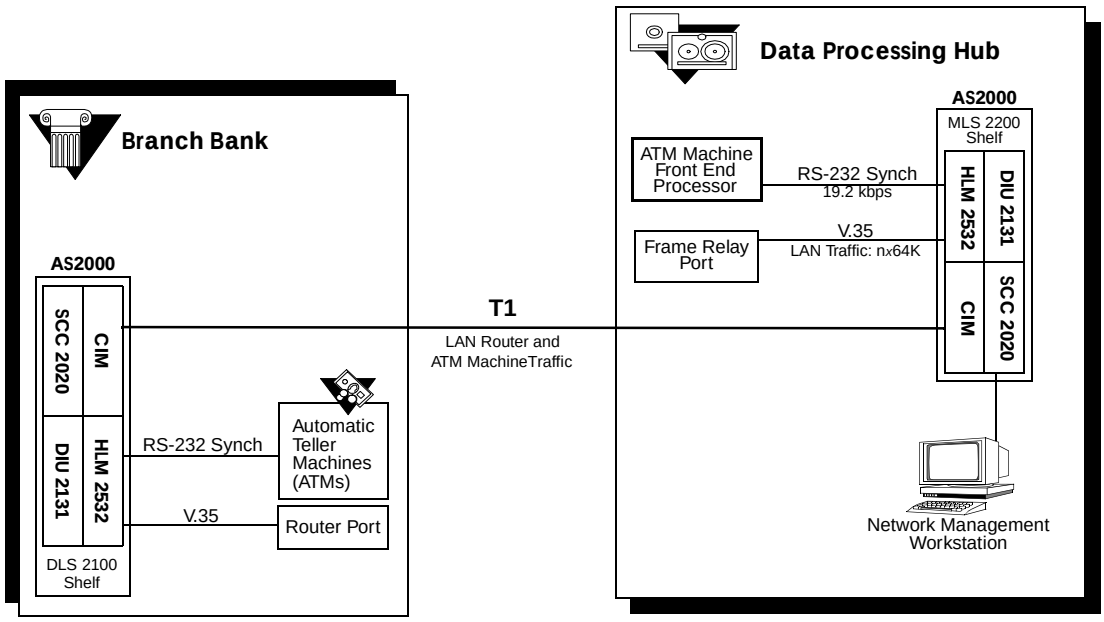
This chapter describes all of the steps required to set up the DIU 2131 for a typical application. Your settings may be different, for example the number of timeslots needed for your high-speed application.

Refer to the appropriate controller module and management software user manuals for more detailed information. This chapter focuses on the DIU 2131 configuration.

Sample Application

The DIU 2131 is ideally suited to provide connectivity between branch offices and data processing hubs within the banking industry.

Figure 2-1 Sample Application



We will use the above application for the quick setup procedure, using the following parameters:

- DS0 1 is for a low-speed teller application connected to the Port 2, RS-232 connector.
- DS0s 2-5 are for a 220 kbit/s router connected to the Port 1, V.35 connector.
- The T1 has ESF framing and B8ZS line coding.
- The DIU 2131 is sending data to the T1 port on an SCC 2020 in a Dual-line shelf.
- We are accessing the DIU 2131 via a terminal emulator connected to the Craft port on the SCC 2020.
- The information is passing to the SCC 2020 using Data Bus A (could also be Data Bus B or C).
- The network is providing the master clock.

Physical Configuration

The following steps are required at both ends of the point-to-point connection before configuring the firmware.

1. Put the rear connector module in first. Slide the SCC 2020 into slot 1 of the shelf and the DIU 2131 into slot 2.
2. Connect the router to the V.35 port and the ATM to the RS-232 port. Connect the T1 to the Network port.
3. Power up the shelf.
4. Put the Craft cable from your ASCII terminal emulator to the Craft port on the SCC.
5. Set the terminal communication parameters to:

   19,200 kbit/s

   8 bits

   No parity

   1 stop bit

   Flow control = none

Software Configuration

This section provides the steps required to configure the SCC 2020 and DIU 2131 for our sample application. Only changes required to the default settings are noted.

Logging on

Type “craft” at the **pSH+>** prompt**.** Press ENTER at the **YOUR PASSWORD?** prompt.

SCC 2020

We are not going into detail about how to configure the SCC 2020 for our example. We just need to make sure that the T1 framing and line coding, and the data bus mode are set correctly.

1. Set the framing to ESF-ESF.
2. Set the line coding format to B8ZS-B8ZS and the timing to “recovered”.
3. Set
4. Choose DIU Data Bus A.

The completed SCC **Configuration Menu** is shown below.

DIU 2131

After configuring a CSU, you can configure each associated DIU for operation with that CSU. Configuration and diagnostics for the DIU 2131 are located on the same menu.

From the **Main Menu**, access this screen by using the **Shelf, Slot** option selecting the module and then entering **C** for configuration. Figure 5-2 shows the resulting menu.

Figure 2-2 DIU 2131 Configuration/Diagnostic Menu

```
       --- DIU 2131  CONFIGURATION/DIAGNOSTIC MENU ---

C) CSU              [ 1,1 ]
T) timing source    CSU

   chnl 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Dp)port 01 01 01 01 01 01 01 01 01 01 01 01 .. .. 02 .. .. .. .. .. .. .. .. ..

   Lead Toggles     DTR)   DSR)   RTS)   CTS)   DCD)
   Forced Ports     -/-    -/-    -/-    -/-    -/-

                    Port 1     Port 2        Statistics
Mp) mode            64K        19.2K         FW/HW Rev...1.3/0.8
Sp) scram/hdlc inv  N/N        N/N           Battery.....OK
Kp) clocking        ST         ST            DTE Intf....V.35/RS-232
Gp) LOS lead        NONE       NONE          Data bus....A

Ep) enable loop     YES        YES           Tp) test and monitor BEC
Np) near loopback   OFF        OFF           Pp) monitor leads and status
Fp) far loopback    OFF        OFF           A)  Alarm Enable......NO

[1,2] DIU 2131 >
```

Assigning Timeslots

1. Type “D1” to assign DS0s for Port 1.
2. Type “2-5”.
3. Type “D2” to assign the DS0 for Port 2.
4. Type “1”.

Assign Mode

Since we are using ESF, we have 64 kbit/s available in each timeslot.

5. Type “M2” and select 19.2 kbit/s.

Chapter 3 Configuration Menu

This chapter describes all of the options and settings included in the **Configuration/Diagnostic Menu**.

Pre-requisites

Before configuring the DIU 2131, the associated CSU must be configured for Mux mode. This is done using the **DIU bus** option in the CSU's **Configuration Menu** to choose Data Bus A, B or C. See the CSU manual for more information, either the *SCC 2020 User Manual* or the *TAC 2010 User Manual.*

Configuring the DIU 2131

After configuring the CSU, you can configure each associated DIU.

From the **Main Menu**, use the **Shelf/slot** option to select the DIU 2131 and then enter "C" for configuration. Figure 5-1 shows the resulting menu.

Figure 3-1 DIU 2131 Configuration/Diagnostic Menu

```
     --- DIU 2131  CONFIGURATION/DIAGNOSTIC MENU ---

C) CSU            [ 1,1 ]
T) timing source    CSU

  chnl 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Dp)port 02 .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..

  Lead Toggles     DTR)   DSR)   RTS)   CTS)   DCD)
  Forced Ports     -/-    -/-    -/-    -/-    -/-

                Port 1     Port 2       Statistics
Mp) mode          64K        64K          FW/HW Rev...1.0/0.8
Sp) scram/hdlc inv  N/N        N/N          Battery.....OK
Kp) clocking        ST         ST           DTE Intf....V.35/RS-232
Gp) LOS lead        NONE       NONE         Data bus....A

Ep) enable loop     YES        YES          Tp) test and monitor BEC
Np) near loopback   OFF        OFF          Pp) monitor leads and status
```

Menu Layout

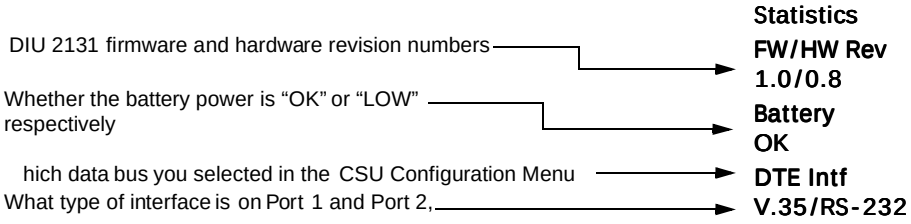
The fields in the **DIU 2131 Configuration/Diagnostic Menu** can be viewed as groups of related functions.

The small letter **p** to the right of most commands is a placeholder for the number of the port you want to access. For example, if you want to enable the loopbacks for Port 1, enter "E1". If you want to enable loopbacks for Port 2, enter "E2".

The upper portion of this display lists the configuration commands and current DIU configuration settings. The lower portion lists the diagnostic commands for the DIU 2131.

The screen above show Channels 1-12 assigned to Port 1 and Channel 15 assigned to Port 2. It also shows the options available after the user has entered the mode (M) command for Port 2.

The statistics area provides the following information:


DIU 2131 firmware and hardware revision numbers
Whether the battery power is "OK" or "LOW" respectively
hich data bus you selected in the CSU Configuration Menu
What type of interface is on Port 1 and Port 2,
Statistics
FW/HW Rev
1.0/0.8
Battery
OK
DTE Intf
V.35/RS-232

The handshake control signals display area fields change to show which ports, if any, are force high.

Lead Toggles	DTR	DSR	RTS	CTS	DCD
Forced Ports	1/2	-/-	-/-	-/-	-/-

In this example, DTR is forced high for Ports 1 and 2. None of the other signals are forced for any port.

Assigning the DIU to a CSU

This assignment establishes the data path between the DIU and the associated CSU using the data bus previously assigned in the CSU **Configuration Menu**.

CAUTION

Any time the DIU bus assignment is changed in a CSU, all DIUs assigned to that CSU need to be reassigned. To reconfigure them correctly, you must re-enter the shelf and slot number for each DIU, even if the correct numbers already appear on the screen.

To assign a DIU to a CSU in the node:

1. Select a related CSU, type "C" on the prompt line of the **DIU 2131 Configuration/Diagnostic Menu**.
2. Press the ENTER key. A new prompt line will appear requesting a shelf number.
3. Enter the number of the shelf you wish to access, and press ENTER. A second prompt line will appear, requesting you to enter the slot number of the related CSU.

Setting DIU up for Multiplexing

Figure 5-2 shows how to set up the DIU 2131 configuration screen for muxing.

Figure 3-2 DIU 2131 Configuration for Mux Mode

If the CSU is in a different shelf, you will need a data bus extension kit. Remember, you must re-enter the CSU if you make bus change .

Unless the signal is going through a DACS, channel assignments must match at both ends of

When using consecutive channels, 64K Mode will require B8ZS in the CSU's network (**F**) line coding.

```
        --- DIU 2131  CONFIGURATION/DIAGNOSTIC MENU ---

 C) CSU                [ 1,1 ]
 T) timing source      CSU

    chnl 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 Dp)port 01 01 01 01 01 01 01 01 01 01 01 01 .. .. 02 .. .. .. .. .. .. .. .. ..

    Lead Toggles       DTR)   DSR)   RTS)   CTS)   DCD)
    Forced Ports       -/-    -/-    -/-    -/-    -/-

                       Port 1      Port 2        Statistics
 Mp) mode              64K         19.2K         FW/HW Rev...1.3/0.8
 Sp) scram/hdlc inv    N/N         N/N           Battery.....OK
 Kp) clocking          ST          ST            DTE Intf....V.35/RS-232
 Gp) LOS lead          NONE        NONE          Data bus....A

 Ep) enable loop       YES         YES           Tp) test and monitor BEC
 Np) near loopback     OFF         OFF           Pp) monitor leads and status
 Fp)  far loopback     OFF         OFF           A)  Alarm Enable......NO

 [1,2] DIU 2131 >
```

Since the Craft interface does not check for errors when you save a configuration, validate the following:

- ☐ Each DIU is assigned to the proper CSU (**CSU** command in DIU menu).
- ☐ The mode (**56k** or **64k**) is correct for Port 1.
- ☐ The channels used on the near end match those on the far end in a point-to-point circuit. For example, if the near end uses DS0s 1-6, the far end must also use DS0s 1-6. If you're going through a DACS, this may not apply.

❑ If you have Verilink equipment at the other end, make sure that an **Fp** (far-end loopback) can be successfully done before turning the circuit over to your customer.

***NOTE:** Errors in* **Dp** *(port), or* **Mp** *(mode) will cause* **Fp** *to fail.*

Summary of Commands

A summary of the commands, their names, and their descriptions is provided in the following table.

Table 3-1 Summary of DIU 2131 Menu Commands

Command	Name	Description
C	csu	Assigns a DIU 2131 to a CSU in the node.
T	timing source	This command either assigns a data port to be the timing source or assigns the CSU to be the timing source. Port 2 cannot support tail-circuit timing. Options are **Port1**, **Port2**, or **CSU**. **NOTE:** Before using this command, you must select the CSU's timing source in the **CSU Configuration Menu**. Also, if the TT clock from a DIU port will be used to provide the timing source to a CSU or TIU for T1 transmit timing, you must use the **C** command to select **TT** (not ST or inverted ST) for that port.
D	port	Assigns one or more available DS0 channel timeslots of a T1 circuit to each data port of the DIU 2131. The number of channels required by Port 1 depends on what transmission mode you select (either 56 kbit/s or 64kbit/s) and the desired aggregate rate. Port 2 never uses more than one timeslot. Since the Craft interface does no error checking, you must make sure that you do not assign the same channel to different ports. Use the following format examples to enter the desired channel(s) for Port 1: **1-6** or **1,3,5,7,9.**
M	mode	Establishes the data transmission mode for the data port selected with the **D** command. Port 1 can be either 56kbit/s or 64kbit/s. Port 2 can be 64, 56, 38.4, 19.2, 9.6, 4.8, or 2.4 kbit/s.
S	scramble data	Scrambles the data stream by changing the ones density before the data stream leaves the designated port. Both the near and far DIUs must have this option set to Yes (**Y**) for the data stream to be understood.
K	clocking	Selects the proper data input clock for each data port of the DIU. • TT Terminal Timing: the data equipment • ST Send Timing generated by the DIU • INV-STInverted ST signal generated by the DIU

Command	Name	Description
G	LOS lead	Allows a Loss-of-Signal (LOS) alarm to be generated when a dropped signal is detected on one of the selected options. The options are **DTR**, **RTS**, and **NONE.** • If you want an LOS alarm when DTR is dropped, enter **1**. • If you want an LOS alarm when RTS is dropped, enter **2**. • If you do not want LOS alarms to be generated at all, enter **3**.
DCD	Data Carrier Detect	This is the voltage threshold determining that the T1 signal is good.
DTR DSR RTS CTS	Data Terminal Ready Data Set Ready Request To Send Clear To Send	DTR, DSR, RTS, and CTS are the DCE-DTE handshake leads. When the handshake leads are not forced, DIU signals "follow" DTE signals. When a lead is forced, the signal is asserted (it's "on"). By default, the DIU signals are not forced high. Rather the DIU follows the input state of the RTS and DTR leads. With this option, the CTS and DSR follow RTS and DTR, respectively. The DCD lead follows the associated CSU's LOF alarms state (DCD off in alarm). The enable state forces the lead high.
E	enable loop	Allows you to enable or disable the data channel loopback (DTE) function on each data port of the DIU. If this function is not enabled, you won't be able to activate or deactivate the specific loopbacks with the **N** (near loopback) or **F** (far loopback) commands.
N	near loopback	Activates and clears a data channel loopback on the currently accessed (near-end) DIU.
F	far loopback	Activates a data channel loopback at the far-end DIU 2131. This command sends a loop-up code on the selected DIU data channel to the far end. Upon receiving this code, the far-end DIU activates the appropriate data channel loopback.
T	test and monitor BEC	Initiates and monitors a DIU test pattern for errors.
P	monitor leads and status	Shows the monitor leads and their status.

The screen also provides selected "read-only" statistics. These include the hardware revision, which firmware version is running, what connector modules are attached to each port and what data bus is being used for the DIU 2131.

Chapter 4

Diagnostics and Troubleshooting

Once elements for an application are installed, configured, and running, you need a way to make sure that your expectations and requirements for performance are met.

The DIU 2131 provides several built-in features that make circuit maintenance and testing possible:

LEDs	Provide a visual indication of normal and abnormal conditions for each module.
Loopbacks	CSU and DIU loopbacks can isolate problems in the signal path. Each loopback includes a specific portion of the signal path, and different loopbacks may "overlap" a common area. You can isolate a problem area by applying a logical succession of loopbacks and comparing which loopbacks succeed and which fail.
Test signals	Each CSU can apply a test signal to the circuit through operator-issued commands.

Performance registers are available in the CSU **Performance Monitoring Menu**.

DIU 2131 Front Panel

The DIU 2131 front panel has three LEDs for each customer data port:

Near End Loop LED

The Near End Loop LED lights yellow when the associated data port is looped on the DIU.

Far End Loop LED

The Far End Loop LED lights yellow when the associated data port is looped at the far-end DIU. This occurs only if the loop-up command was sent by the near-end DIU to the far-end DIU over the T1 circuit.

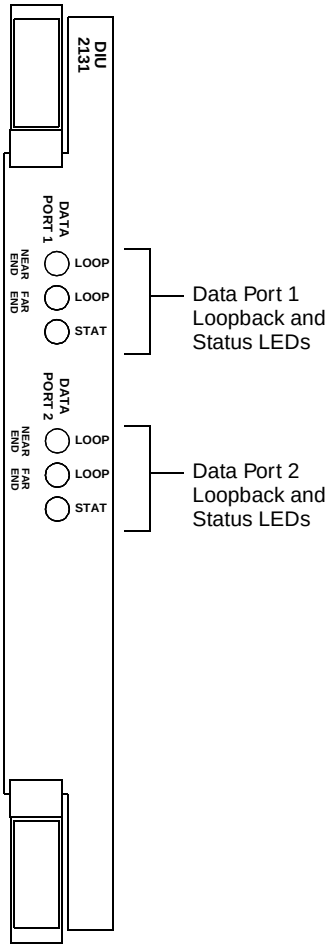
STAT LED

The STAT (DIU 2131 status) LED is a tri-color indicator which shows one of the following conditions for each data port:

- **Lit Green:** DIU is working properly (normal operation).

- **Flashing Green:** DIU is accessed by a node controller thumbwheel switch operator. Both the PORT 1 and PORT 2 STAT LEDs flash green during this time.
- **Solid Green for 6 Seconds, then 2 Flashes of Red (repeated):** This indicates that there is a loss-of-signal on the data port.
- **Solid Green for 6 Seconds, then 3 Flashes of Red (repeated):** This indicates that the DIU 2131 has a low battery. This alarm will only be displayed by both STAT LEDs.
- **Lit Red:** DIU is faulty or problem in equipment connections. Replace the DIU.
- **Lit Yellow:** Associated data channel is under test by an operator (a test signal is being applied by the DIU).
- **Flashing Red:** Power-up self test failure. Could indicate an incorrect rear connector module has been installed.
- **Flashing Red and Yellow:** DIU has failed an operator-initiated data channel test.
- **Not Lit:** DIU is not powered up (power is lost).

Figure 4-1 DIU 2131 Controls and Indicators



Monitoring Test Pattern Errors

The DIU 2131 has bidirectional loopbacks that can be used with test patterns.

The **T** (Block Error Counter) command generates and monitors a DIU test pattern for errors. The monitoring is "real time," not historical. The count is updated every second.

The DIU test runs on user-selected time slots. It tests the integrity of the T1 link between two DIUs.

The test can only be run in two ways:

(a) (b)

A. Into a far-end loopback (bidirectional DIU loopback)

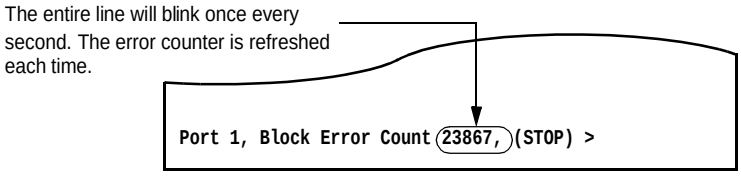
B. Against another DIU running its test pattern with no loopback set

This test is performed after setting a far-end loopback, using the **F** command.

To monitor the block error counter:

1. Type **T** and the port number in the prompt line of the **DIU 2131 Configuration/Diagnostic Menu**.

2. Press ENTER. The following line displays.


The entire line will blink once every second. The error counter is refreshed each time.
Port 1, Block Error Count 23867, (STOP) >

3. Press ENTER to stop the test and exit the screen.

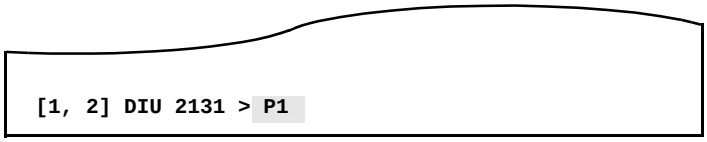
4. The screen is updated every second to display the sum of all errors detected from the start of the test. Count information is not stored.

Monitoring Leads and Status

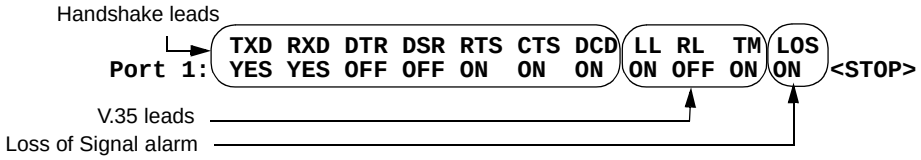
The **P** command lets you monitor the status of the leads between the DTE (Data Terminal Equipment) and the DCE (Data Carrier Equipment).

To monitor the status of the leads:

1. Type "P" and the port number in the prompt line of the **DIU 2131 Configuration/Diagnostic Menu**.



2. Press ENTER. The following information displays in the prompt line area.


Handshake leads
TXD RXD DTR DSR RTS CTS DCD LL RL TM LOS
Port 1: YES YES OFF OFF ON ON ON ON OFF ON ON <STOP>
V.35 leads
Loss of Signal alarm

This is what the fields mean:

Field	Description
TXD	YES: transitions are detected in transmit data
(Transmit Data)	NO: DTE is not transmitting data (idle)
RXD	YES: transitions are detected in receive data
(Receive Data)	NO: the DIU is not outputting receive data (idle)
DTR	ON: DTE is asserting Data Terminal Ready
(Data Terminal Ready)	OFF: DTR is not asserted by the DTE
DSR	ON: DIU is asserting Data Set Ready
(Data Set Ready)	OFF: DIU is holding DSR low
RTS	ON: DTE is asserting RTS
(Request To Send)	OFF: RTS is not high
CTS	ON: DIU is asserting CTS
(Clear to Send)	OFF: the DIU is holding CTS low
DCD	ON: DIU is asserting DCD
(Data Carrier Detect)	OFF: the DIU is holding DCD low

Field	Description
LL (Local Loop)	ON: DTE is requesting a Local Loopback by asserting the designated lead on the synchronous serial interface OFF: the DTE is not requesting a test
RL (Remote Loop)	ON: DTE is requesting a Remote Loopback by asserting the designated lead on the synchronous serial interface OFF: the DTE is not requesting a test
TM (Test Mode)	ON: DIU is in any test mode OFF: the DIU is not in any test

3. Press **ENTER** to exit the screen.

4. The screen updates every second to display the status. Status information is not stored.

Appendix

A

Specifications

The specifications for the DIU 2131 are given below:

Applications Interface

Data Rate	Port 1: $n \times 56/64$ kbit/s increments Port 2: 2.4, 4.8, 9.6, 19.2, 28.8, 38.4, 56, 64 kbit/s
Number of Data Ports	2
Channelization	SF/ESF, user-assigned slots

Data Port Loopbacks Bidirectional

Interface Module

HLM 2532	Port 1: V.35, Winchester type, female Port 2. RS-232, DB-25 type, female

Index

A

alarms
  LOS 3-5
applications using
  devices with synchronous connections 2-1

B

battery, clock chip iii
block error counter 4-3
  command for 4-3

C

C command 3-4
channel assignment 3-3
Clear To Send 3-5, 4-4, 4-5
  See also CTS
command summary
  DIU 2130 Menu 3-4
commands
  C, assign DIU to CSU 3-4
  D, assign DS-0 channels 3-4
  E, enable DTE loop 3-5
  F, set far data channel loop 3-5
  G, LOS lead 3-5
  K, data input clock 3-4
  M, data transmission mode 3-4
  N, set near data channel loop 3-5
  P, monitor leads and status 3-5
  S, scramble data stream 3-4
  T, port for timing 3-4
  T, test and monitor BEC 3-5
CTS 3-5, 4-4
  See also Clear To Send

D

D command 3-4
Data Carrier Detect 3-5, 4-4
  See also DCD
Data Carrier Equipment 4-4
Data Set Ready 3-5, 4-4
  See also DSR
Data Terminal Equipment 4-4
Data Terminal Ready 3-5, 4-4
data transmission mode 3-4
DCD 4-4
  See also Data Carrier Detect
DIU
  configuration settings 3-2
  data transmission mode 3-4
  timing source 3-4
DIU 2130 2-3, 3-1
  assigning to CSU 2-3, 3-2, 3-4
  clocking 3-4
  enable loop 3-5
  menu layout 3-2
  near loopback 3-5
  port assignment 3-4
  statistics 3-2
DSR 4-4
  See also Data Set Ready
DTR 3-5, 4-4
  See also Data Terminal Ready

E

E command 3-5
enable loop command 3-5
errors
  far loopback failure 3-4

F

F command 3-5, 4-3
far loopback command 3-5

G

G command 3-5

I

INV-ST 3-4
  See also inverted timing

K

K command 3-4

L

LEDs
  for troubleshooting 4-1
LL 4-5
  See also local loop
local loop 4-5
Loopbacks
  for troubleshooting 4-1
loopbacks, DIU 2130
  enable DTE loop 3-5
  enable loops 3-5
  far data channel loop 3-5
  far loopback 3-5
  near data channel loop 3-5
  near loopback 3-5
Loss of Signal 3-5
  LOS alarm 3-5
  LOS lead command 3-5

M

M command 3-4
monitor leads and status command 3-5
mux mode
  channel agreement 3-3
  validating the configuration 3-3

N

N command 3-5
near loopback command 3-5

P

P command 3-5, 4-4

R

Ready To Send 4-4
Receive Data 4-4
Request To Send 3-5
  See also RTS
RL 4-5
  See also Remote Loop
RTS 3-5, 4-4
  See also Request to Send
RxD 4-4

S

S command 3-4
scrambling the data stream 3-4
ST 3-4

T

T command 3-4, 3-5
test and monitor BEC command 3-5
test mode 4-5
test signals
  errors 4-3
TM 4-5
  See also Test Mode
TT 3-4
  See also terminal timing
TxD 4-4

September 1999

P/N 880-502765-001D1

VERILINK CORPORATION
127 JETPLEX CIRCLE,
MADISON, ALABAMA 35758
TEL: (800) 837-4546